In-Space Remote Sensing

Revolutionary Aerospace Systems and Concepts (RASC)
Group 4
FY-02 Planning

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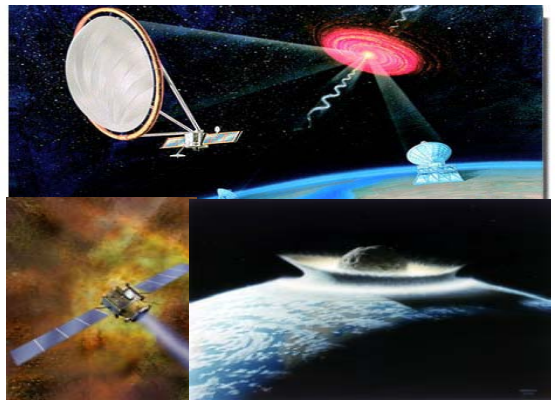
Introduction

- The *primary objective* is to develop revolutionary aerospace systems concepts for in-space remote sensing



- *Scope*: The study missions will include in-space remote sensing for Earth Observation, Space Exploration, and Comet and Asteroid Detection and Protection.

Overarching Mission

- **The *overarching mission* is to use the revolutionary aerospace mission architectures and systems concepts as the foundation for identification of common technology and infrastructure requirements for in-space remote sensing**

- **Common technology areas exist between the current set of mission studies. Key technology areas will be assessed through additional focused assessments (when resources are available):**

  - Formation flying
  - Inter-vehicle communications
  - Metrology
  - Autonomous operations

- **Infrastructure requirements will be fed to the other RASC groups to provide input to their concept definitions as well as to leverage their analysis results**

Relationship to Enterprise Goals

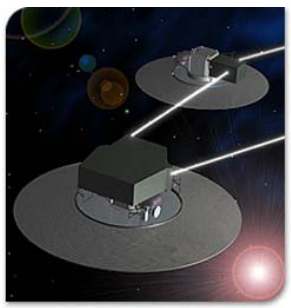
- **Space Science Enterprise**
  - Goal 1: Chart the evolution of the universe, from origins to destiny, and understand its galaxies, stars, planets and life
  - Goal 3: Develop new technologies to enable innovative, less expensive flight missions
- **Earth Science Enterprise**
  - Goal 1: Observe, understand, and model the Earth system to learn how it is changing, and the consequences for life on Earth
  - Goal 3: Develop and adopt advanced technologies to enable mission success and serve national priorities
- **Aerospace Technology Enterprise**
  - Goal 3: Pioneer technology innovation: enable a revolution in aerospace systems

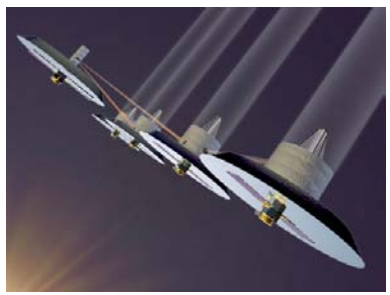
Study Missions

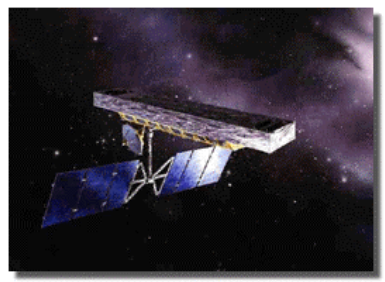
- **The *study missions* currently include Earth observation, space exploration, and comet and asteroid detection and protection systems/architectures:**
  - Space Based Imaging Interferometry
  - Fresnel Lens System for Gamma Ray Astronomy: Micro-arcsecond Imaging of Black Hole Event Horizons
  - Study of Revolutionary Earth Sciences Architecture for Atmospheric Chemistry, Earth Radiation Balance, and Geomagnetism Measurements
  - Comet and Asteroid Protection System (CAPS)
  - Planetary Body Maneuvering

Study Missions (con't)

- **Space Based Imaging Interferometry**
  - David Leisawitz, GSFC
  - Evaluation of space-based imaging interferometry
  - Michaelson and Fizeau interferometers installed on booms, tethers, and free flyers will be assessed to meet Code S and Code M key science objectives
  - Alternative architectures for space-based imaging will be developed as well as analytical tools, decision trees and performance metrics for facilitating mission design

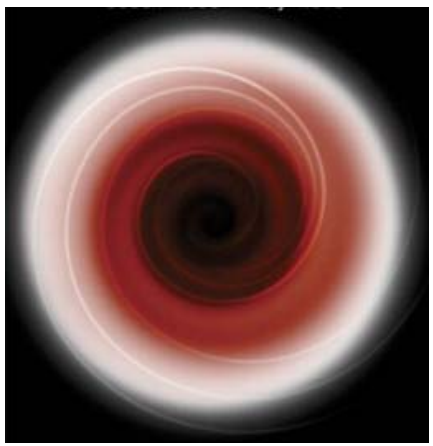






Study Missions (con't)

- **Fresnel Lens System for Gamma Ray Astronomy: Micro-arcsecond Imaging of Black Hole Event Horizons**
  - Neil Gehrels, GSFC
  - Assessment of a mission concept that includes a Fresnel lens on one spacecraft and a gamma-ray detector on a second spacecraft with approximately 10,000,000 km distance between them
  - Station keeping, propulsion, needs, orbital dynamics, target acquisition concepts, and formation flying will be addressed



Study Missions (con't)

- **Study of Revolutionary Earth Sciences Architecture for Atmospheric Chemistry, Earth Radiation Balance, and Geomagnetism Measurements**
  - Dr. Shahid Habib, GSFC
  - A range of advanced platforms required for making Earth science measurements in the upper stratosphere will be investigated
  - The revolutionary technologies necessary for each platform needed to make the desired measurements will be identified

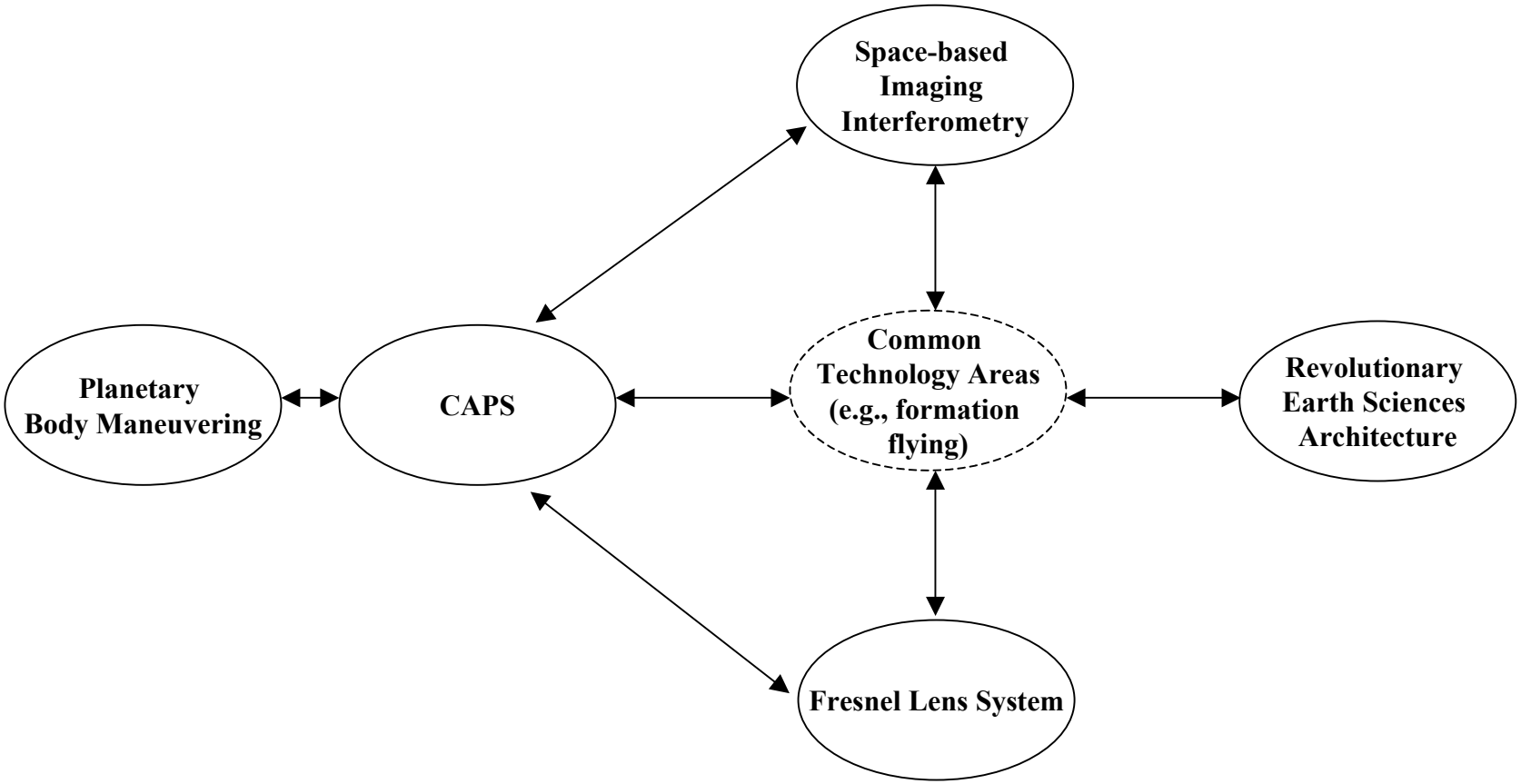
Study Missions (con't)

- **Comet and Asteroid Protection System (CAPS)**
  - Dan Mazanek, LaRC
  - Focus will be on the preliminary definition of CAPS detection concepts, Near-Earth Objects (NEO) orbit modifications, and an overall architectural concept for CAPS implementation
  - Detailed systems analysis of the detection system will be performed to identify critical technology pull requirements

Study Missions (con't)

- **Planetary Body Maneuvering**
  - Dr. George Schmidt, MSFC
  - The objective is to examine simple, medium, and advanced techniques for moving small planetary bodies
  - The application of the associated techniques could range from commercial space operations to planetary defense

Relationships Between Study Missions



- Each of the five planned Group 4 study missions will be stand-alone activities; however, results of several studies will feed other Group 4 studies as well as assessments of common technologies

Study Missions
Relationship to Wavelength

	Space Based Imaging Interferometry	Fresnel Lens System for Gamma Ray Astronomy	CAPS
Microwave			
Infrared	X		X
Visible	X		X
Ultraviolet	X		
X-Ray	X		
Gamma-Ray		X	

Summary

- **Technologies and infrastructure for conducting revolutionary in-space remote sensing will be investigated**
- **The study missions currently include Earth observation, space exploration, and comet and asteroid detection and protection**
- **Key technology areas will be assessed through additional focused assessments (when resources are available):**
  - Formation flying
  - Inter-vehicle communications
  - Metrology
  - Autonomous operations
- **Infrastructure requirements will be input to other RASC groups and the associated results will be leveraged**